

21

The invention claimed is:

1. An optoelectronic device comprising:
a substrate including a first portion, the substrate being removed to a first depth in the first portion;
an active layer that is suspended over the first portion, the active layer comprising a first material, the first material being characterized by a first band structure having a first direct bandgap when in bulk form; and
a first layer that is horizontally adjacent to and in physical contact with the active layer;
wherein the first material is characterized by a second band structure having a second direct bandgap that is different than the first direct bandgap when the active layer is suspended over the first portion.
2. The optoelectronic device of claim 1, wherein at least a portion of the first layer is suspended over the first portion.
3. The optoelectronic device of claim 1, wherein the first material comprises germanium.
4. The optoelectronic device of claim 1, wherein the first material is non-absorptive for light at a first wavelength when it is characterized by the first band structure, and wherein the first material is absorptive for light at the first wavelength when it is characterized by the second band structure.
5. The optoelectronic device of claim 4, wherein the optoelectronic device comprises a light-emitting device that emits light at the first wavelength.
6. The optoelectronic device of claim 5, wherein the optoelectronic device comprises a light-emitting diode.
7. The optoelectronic device of claim 5, wherein the optoelectronic device comprises a laser.
8. The optoelectronic device of claim 4, wherein the optoelectronic device comprises a photodetector that is operable for detecting light at the first wavelength.
9. The optoelectronic device of claim 4, wherein the optoelectronic device comprises an optical modulator that is operable for modulating light at the first wavelength.
10. The optoelectronic device of claim 1, wherein the first layer comprises a plurality of holes, and wherein the first layer and the plurality of holes collectively define a photonic crystal.
11. The optoelectronic device of claim 1, wherein the first layer comprises a plurality of epilayers, and wherein at least one of the plurality of epilayers comprises a second material.

22

12. The optoelectronic device of claim 1, wherein the optoelectronic device comprises a device structure that excludes the first layer.

13. An optoelectronic device comprising:

- a substrate including a first portion, the substrate being at least partially removed to a first depth within the first portion;
 - an active layer comprising a first material that has a band structure having a direct bandgap, the first material having a first absorptivity for light at a first wavelength when the first material is in bulk form; and
 - a first layer that is horizontally adjacent to the active layer, the first layer being dimensioned and arranged to suspend the active layer over the first portion;
- wherein the first material has a second absorptivity for light at the first wavelength when the active layer is suspended over the first portion, and wherein the second absorptivity is greater than the first absorptivity.
14. The optoelectronic device of claim 13, further comprising a region of the substrate that is in physical contact with the active layer in the first portion.
 15. The optoelectronic device of claim 13, wherein the first layer comprises a plurality of holes, and wherein the first layer and the plurality of holes collectively define a photonic crystal.
 16. The optoelectronic device of claim 13, wherein the first material comprises germanium.
 17. The optoelectronic device of claim 13, wherein the optoelectronic device comprises a light-emitting device that emits light at the first wavelength.
 18. The optoelectronic device of claim 13, wherein the optoelectronic device comprises a photodetector that is operable for detecting light at the first wavelength.
 19. The optoelectronic device of claim 13, wherein the optoelectronic device comprises an optical modulator that is operable for modulating light at the first wavelength.
 20. The optoelectronic device of claim 13, wherein the active layer comprises germanium and the substrate comprises silicon.

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